As mobile devices have become the personal information-processing interface of choice, many individuals seem to swiftly follow fashion. Yet, the literature is silent on how early adopters of mobile devices overcame uncertainties related to shifts in technology. Based on purposive sampling, this paper presents detailed insights into why and how five closely related individuals made the decision to adopt the iPhone before it was available through traditional supply chains. Focusing on the role played by social networks, we analyze how adoption threshold, opinion leaders, social contagion, and social learning shaped adoption behaviors and outcomes. The analyses confirm that network structures impacted the early decision to accept the iPhone; they show that, when facing uncertainty, adoption decisions emerged as a combined result of individual adoption reflections and major influences from the social network as well as behaviors observed within the network; and, they reveal interesting behaviors that differed from expectations. In conclusion, we discuss implications for both theory and practice.

Keywords: adoption, social networks, adopter characteristics, qualitative research
INTRODUCTION

Advanced mobile devices, such as smart phones and personal digital assistants, have become ubiquitously available and have changed the ways people organize relationships (Haddon 1997). Mobile users carry their device everywhere, they use it around the clock, and it has become their personal information-processing interface of choice. The symbolic value of these devices has increased, and many mobile users, therefore, swiftly follow fashion and change brand, as new devices and features become available. As a recent example, when Apple introduced the iPhone to the U.S. market in July 2007, 270,000 devices were sold in the first thirty hours of the launch weekend and eight million in total in the U.S. during 2007 (Brightman 2008). The original iPhone was subsequently made available in five other countries: the UK, Germany, and France (November 2007), as well as Ireland and Austria (March 2008). However, early use of the iPhone was not limited to these countries. Countless users around the world acquired iPhones from the six official markets, and started to use them in their home countries. To do so, they needed to unlock the phone from the SIM-card and adapt it to network providers other than Apple’s exclusive partners, i.e., AT&T in the U.S. During this period, one million iPhones, equivalent to 27 percent of the 2007 U.S. sales, were adapted to other networks.

While shifts in technology occur regularly, change of technology brand bears several switching costs for adopters, including initial fixed costs, uncertainty about quality of device, and time spent on learning how to use the new technology (Hall and Kahn 2003). For early adopters, these costs are even higher as they have no references to imitate or expert users to consult. Nevertheless, the literature is silent on why and how individuals overcome these uncertainties as they decide to adopt a new voluntary technology such as a mobile device. Early adopters have imperfect information about the benefits of a new technology, and, therefore, their behavior largely depends on acquired human capital, relevant information (Wozniak 1987) and in some cases also on access to unique technical skills (Hall and Kahn 2003).

Against this backdrop, this study investigates why and how five closely related individuals made the decision to adopt the iPhone before it was made available through conventional supply chains. Contextual factors, such as one’s social environment, generally have significant impact on technology adoption and usage behaviors (Lewis et al. 2003; Magni et al. 2008). The role of social networks has also been used more broadly to understand social behavior (Van den Bulte and Lilien, 2001; Vidgen et. al., 2004) and information systems practices (Cambell and Russo 2003). Following these insights, our assumption is that a social network perspective will help us understand the context in which the five individuals managed to adopt the iPhone despite the many uncertainties they faced.

Purposive sampling (Teddlie and Yu 2007; Maxwell, 1997) allowed us to investigate social influences on how individuals adopt mobile devices at a very early stage, i.e., before the official product launch. Because the sample represents a rather closely related group of individuals, we had direct access to rich data about these individuals, their mutual relationships, and their interactions with other people and information sources. Below, we unfold and

CONTRIBUTION

The research contributes to the IS literature in a number of ways. First, it describes a group of very early adopters of a groundbreaking technology and their efforts to overcome uncertainties when switching costs are high. The study provides an in-depth description of this group of adopters and helps us understand the specific profile of early adopters of an iPhone.

Second, based on a social network perspective, we show that traditional network measures can provide an in-depth understanding of the decision-making processes of early iPhone adopters. We provide multiple perspectives on adoption using four measures from the social network literature to explain how the social network influenced individual adoption decisions.

Finally, this research is relevant to both academics and practitioners. Academics may apply our findings to explain why and how individuals adopt emergent devices that break away from previous devices and are not yet available through conventional supply chains. Practitioners can obtain new insights into the behaviors of early adopters of mobile devices and may incorporate these into their mobile device and development strategies.

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present our analysis of these data as follows. First, we review the literature on adoption of mobile devices and services. We then present the social network perspective and explain our choice of research design that guided the empirical investigation. After a detailed presentation of the characteristics of the observed adopters and our analysis of their adoption decisions, we conclude and discuss the implications for theory and practice, as well as limitations of our study.

ADOPTION OF MOBILE DEVICES

Our research draws on the specific literature on adoption of mobile devices, as well as the general literature on individual adoption of communication technologies within information systems research. Adoption is the result of a decision-making process whereby an individual, group, or organization engages in activities that lead to a decision to use an innovation (Rogers 2003). Today’s advanced devices combine communication and computing into a multipurpose gadget that provides users with various types of services (Bergman 2000). Furthermore, they have a one-to-one binding with the user, offer ubiquitous access, and provide a set of utilitarian and hedonic functions (Hong and Tam 2006). With this definition, we consider mobile services and applications as part of advanced mobile devices.

Since the early 1990s, research on mobile devices has gained increased attention, as these devices were expected to “revolutionize many aspects of everyday life in the Western world” (Green et al. 2001, p. 146). Adoption research has typically been centered on studies of either the artifact being adopted or the user setting. While adoption research in general has been criticized for lack of attention to the attributes of the adopted devices and services (O’Reilly and Iacono 2001), few studies have considered the mobile artifact as an object of expression (Chuang et al. 2001) and related mobile device design issues (Lee and Benbasat 2003; Tarasewitch 2003).

Historically, the majority of mobile users acquired their device through work, although this did not prevent private and leisure usage (Fisher 1994). Early studies have, therefore, in general studied mobile adoption in organizations, for example, changes in organizational structure (Meehan 1998) and effects on the divide between work and leisure (Nippert-Eng 1996). Later work has also studied the blurring of work- and leisure-related functions of the mobile device (Palen et al. 2001) and the possibilities of business-to-business e-commerce (Wang and Cheung 2004). More recently, the focus has increasingly shifted toward individual adoption, as the mobile device has become the personal information-processing interface of choice. Studies are now concerned with the commercial possibilities, e.g., how mobile commerce exposure influences adoption (Khalifa and Cheng 2002); how users create value when adopting mobile banking services (Laukkanen and Lauronen 2005); and which factors induce users to accept mobile devices to communicate promotional content (Bauer et al. 2005).

Understanding variations in adoption patterns between the personal and professional context and across individual, group, and organizational levels raises interesting issues related to voluntary versus compulsory adoption (Venkatesh et al. 2003; Moore and Benbasat 1991). Individual level adoption is generally optional and organizational adoption is more often than not based on authoritative decisions. It is, however, far from clear whether group adoption of mobile devices is the result of a collective decision or whether it emerges as the result of individual decisions by the members of the group with only minor influence between group members during the decision making process. As many organizations allow their employees to choose a preferred device, most of the recent research continues to be concerned with the individual level adoption (Tscheming and Damsgaard 2008).

Pedersen and Ling (2002) suggest that adoption research in general “seeks explanations of why a particular adoption behavior may be observed at the individual level” (Pedersen and Ling 2002, p. 9). They found three explanatory approaches that may also be applied to adoption of mobile devices. These are rationalistic or utilitarian explanations, explanations based on social influence, and explanations focused on personal characteristics. Utilitarian studies use constructs such as usefulness and ease of use to measure individuals’ willingness to adopt, exemplified by Carlsson et al.’s (2000) application of the UTAUT (Unified Theory of Acceptance and Use of Technology) model to explain acceptance of mobile devices and services. Social influence explanations add elements of how social mechanisms influence individuals’ adoption of a particular mobile device or service. One illustration is Lu et al.’s (2005) investigation of the relationships between personal innovativeness and social influences on one side and intention to adopt wireless Internet services via mobile technology on the other. Their study also covers the third kind of explanatory variable in mobile adoption research—personal characteristics—and it develops and validates measures for personal innovativeness perceived as a personal trait of adopters (Agarwal and Prasad 1999). In addition, the literature offers attempts to describe different categories of adopters. Constantiou et al. (2007) developed a grouping that divides mobile users into distinct consecutive categories: talkers, writers, photographers and surfers, and Pedersen (2005) studied the adoption of mobile commerce of early adopters by extending the Theory of Planned Behavior (TPB) with the Technology Acceptance Model (TAM) constructs to explain early adoption of mobile commerce.
While existing research provides useful insights into the relationship between constructs that may lead to acceptance or rejection of mobile devices, recent studies (Lyytinen and Yoo 2002; Sarker and Wells 2003) have called for research to further examine factors that explain mobile device adoption. Lyytinen and Yoo (2002) argue that the emergence of nomadic information environments, which is a result of high levels of mobility, digital convergence, and mass scale services and infrastructure, calls for a re-analysis of the adoption of devices and services at all levels, including individuals, groups, and organizations.

Against this backdrop, we are not aware of research that focuses on how early adopters of mobile devices leverage their social networks to overcome uncertainties related to shifts in technology. While a few studies investigate social influence on mobile adoption (Dickinger et al. 2008; Lu et al. 2005), they mainly develop and test models explaining causal relationships between different constructs and adoption. Only one study (Dickinger et al. 2008) employs an exploratory phase, followed by model development and testing, analyzing the effect of peers on individuals’ adoption behavior of a VoIP (Voice over Internet Protocol) service. This study concludes that with highly interactive services, social norms are strong drivers of usefulness and perceived enjoyment due to network effects. Another study (Lu et al. 2005) takes a Structural Equation Modeling approach to assess the relative importance and the strength between different constructs, including perceived enjoyment, social norm, usefulness, ease of use, and intention to use. With the aim to achieve representativeness, they show that a mobile user’s social network influences the individual’s adoption decision. They do not, however, address social influence on early adoption decision as a result of technology shifts in the mobile market, and they do not reflect on the thought process of mobile users’ that enables adoption.

This gap in the literature limits our understanding of how early adoption decisions are shaped by an individual’s peers and network. We suggest that by analyzing frequent exposure to news from traditional and electronic media, active participation in discussion groups, and readily available access to unique technical capabilities, we can offer additional explanation as to why and how a group of closely related individuals made the decision to adopt a mobile device before it was made available through traditional supply chains.

SOCIAL NETWORK INFLUENCE

A social network is a structure of individuals or organizations connected by some type of interdependency (Wasserman and Faust 1994). The relationship between the actors depends on the context as well as the research question being studied. Social influence is more meticulously defined as the “change in an individual’s thoughts, feelings, attitudes, or behaviors that results from interaction with another individual or a group” (Rashotte 2007, p. 1). Earlier definitions included norms and roles (French and Raven 1959); however, the current notion is that individuals make genuine changes to their feelings and behaviors as a result of interaction with others, who are perceived to be similar, desirable, or experts (Rashotte 2007). We use the term social network influence as we investigate social influence from an individual’s social network.

It is widely accepted that our social and professional lives are constituents of interactions, with many actors linked together in network structures and that these structures impact the performance of the network (Vigden et al. 2007). The structure of a system can either favor or impede diffusion and adoption of innovations (Katz 1961; Rogers 2003). Therefore, the notion of a social network has attracted considerable interest from the social and behavioral sciences, such as sociology (Clawson et al. 1986; Emirbayer and Goodwin 1994), anthropology (Wellmann 1999), epidemiology (Rothenberg et al. 1998; Potterat et al. 1999), economics (Bala and Goyal 1998; Manski 2000; Chwe, 2000) and diffusion of innovations theory (Coleman et al. 1957; Coleman et al. 1966; Burt 1986; Young 1999). Many of these studies use social network analysis to investigate complex sets of relationships between members ranging from interpersonal, over inter-organizational, to international. Barnes (1954) was one of the first to use the term systematically when he discovered that, though a community shared cultural values, most individuals made decisions with reference to personal contacts. Social network analysis has since been developed (Friedkin 1980; Burt and Minor 1983; Krackhardt 1987, 1990; Wasserman and Faust 1994) to include technological networks and derived effects; e.g., the long tail (Anderson 2006; Oestreicher-Singer and Sundararajan 2008) and user-generated content in online social networks (Oh et al. 2006).

Another stream of research investigates central constructs in analysis of social network structure and interdependency between actors. These constructs describe partly overlapping forms of social network influence and represent increasing levels of sophistication from quantitative oriented measures toward comprehensive frameworks for understanding. In the following, we review these constructs: adoption threshold, opinion leaders, social contagion, and social learning—in increasing order of sophistication.
Valente (1996) studied previous categorizations of innovation adopters, such as the well-known classification by Rogers (2003) and Ryan and Gross (1943, 1950) and used these to create personal or system network threshold categories. Thresholds are the proportion of adopters in a social system needed for an individual to adopt an innovation (Granovetter 1978). The threshold model follows Rogers’ division of adopters and demonstrates that very low threshold individuals have thresholds two standard deviations lower than the average threshold for the network or community, and very high threshold individuals have thresholds two standard deviations higher than the average. Adoption thresholds, therefore, can be viewed as a characteristic of adopters. Valente (1996) argues further that innovativeness can be distinguished with respect to their personal network or the social system. Mobile users with high network thresholds who adopt early relative to the social system are only innovative relative to the entire system, not compared to their personal communication network. Low network threshold adopters are individuals who adopt early relative to their personal network, yet they may, though not necessarily, adopt late relative to the social system.

Opinion leader (Burt 1999; Valente and Davis 1999; Watts and Dodds 2007; Oh et al. 2006) is another social system construct. The definition of opinion leaders is more precisely “opinion brokers who carry information across the social boundaries between groups” (Burt 1999, p. 37). They are located at the edge of networks and act as brokers between groups and may induce two mechanisms: contagion by cohesion as opinion leaders diffuse information across groups, and contagion by equivalence as opinion leaders stimulate adoption within a group. Contagion by cohesion is dependent on the strength of the relationship between two individuals. The more frequent communication between the two, the more likely it is that one individual will adopt an innovation of the other individual. Discussions between the two allows the adopting individual to come to a normative understanding of costs and benefits of adopting the idea. Contagion by structural equivalence refers to the degree to which two individuals have similar relationships to other people; i.e., their extended network. Contagion, therefore, may occur because of competition or simply because they have a similar idea of what will make them attractive to their network.

Social contagion refers to an actor’s decision to adopt an innovation depending on other actors’ attitudes, knowledge, or behaviors concerning the innovation. Studies (Van den Bulte and Lilien 2001; Dodds and Watts, 2004) have established that those individuals most receptive to social contagion have an enormous influence on the diffusion and adoption process. Influential individuals could be single opinion leaders or it could be a number of individuals from one’s social network making their adoption decision visible. Consequently, social contagion is an outcome of the individual’s structural position in the network. Degree centrality can be calculated from the number of direct ties an individual has, divided by the number of ties in the system. Adopters with a higher number of direct ties have greater opportunities to disseminate and receive information about a technology because they have more ties and, therefore, more choices (Granovetter 1973; Burt 1999). Thus, the number of direct ties captures the power and the opportunities to receive information. Van den Bulte and Lilien (2001) identify a number of theoretical accounts from the literature that describe different causal mechanisms of social contagion. These are information transfer (Katz and Lazarfeld 1955), which may occur from both traditional and electronic media; normative pressures (Coleman et al. 1966), which may occur when an adopter feels discomfort or when peers, whose approval they value, have adopted an innovation, but they have not; competitive concerns (Burt 1995), which can be viewed as opposed to normative pressures; and, performance network effects (Katz and Shapiro 1999) that refer to the benefits of use that increase with the number of prior adopters of the innovation.

Social learning is a related factor that affects an individual’s choices when faced with substantial uncertainty in sampling new innovations. It occurs through the observation of neighbors’ choices (Tarde et al. 2008). A common explanation for such changes in behavior is that innovations create uncertainty about expected consequences, and to overcome uncertainty, individuals tend to interact with their social network to consult on others’ adoption decisions through informational and normative social influences (Burkhardt and Brass 1990; Katz 1980; Katz and Tushman 1979). While learning occurs as a conscious process of interactions between related individuals, contagion may be the mere result of brief encounters with individuals who share information about the iPhone. Oh et al. (2006) built on Ellison and Fudenberg’s (1993) prior research and found evidence for a number of mechanisms by which social influence is transmitted, such as preference for conformity and social learning.

The four constructs all contribute to explaining social behavior in networks. We adopt them to investigate how five closely related individuals made the decision to adopt the iPhone before it was made available through conventional supply chains. Hence, with a focus on how early adopters of mobile devices overcome uncertainties related to shifts in technology, we draw on the adoption threshold, opinion leaders, social contagion, and social learning constructs to investigate:

How and why does the social network of early adopters of the iPhone impact their decision to adopt?
RESEARCH METHOD

We chose the case study method to investigate this research question because it is preferred when “how” or “why” questions are being posed, when the extent of control of the investigator is little, when the focus is on a contemporary phenomenon and not historical events (Yin 2008), and when the focus is on understanding the dynamics within a single setting (Eisenhardt 1989). We further conducted an exploratory study, as opposed to a descriptive or experimental study (Yin 2008), because we aimed at learning how and why five closely related individuals made the decision to adopt an iPhone before it was made available through conventional supply chains.

Inspired by Eisenhardt’s (1989) process of building theory from case studies, we adopted the same conceptual framing throughout our investigation, though our goal was not theory building in particular, but rather exploration and presentation of empirical insights. We first identified the research question and adopted four social network concepts as a priori framing constructs. We then selected specific early adopters of the iPhone as our case material to help answer the research question. After generating an interview guide, based on the identified theoretical constructs, and while collecting data, we initiated the analysis phase. In this phase, we analyzed and reflected on the data to present new insights. As Eisenhardt (1989) emphasizes, this was a highly iterative process.

Research Context

The case focuses on five individual mobile users who adopted the iPhone prior to its official release in Denmark. Denmark is among the leading countries in the use of mobile devices and mobile communication services (Economist Intelligence Unit 2008) and is, therefore, an appropriate venue for studying adoption of the iPhone. The way in which early adopters surmount the uncertainties related to adoption is particular interesting since they experience high switching costs because of lack of references to imitate or expert users to consult. Purposive sampling provided direct access to rich data about these individuals, their mutual relationships, and their interactions with other people and information sources. Purposive sampling techniques are primarily used in qualitative studies when the aim is to select individuals based on a specific purpose associated with answering the research question (Teddlie and Yu, 2007) and extending emergent theory (Eisenhardt 1989). It is, furthermore, a type of sampling in which “particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices” (Maxwell 1997, p. 87). The aim was to gain access to a group of closely related individuals to determine, how their mutual relationship as well as their wider social network influenced their decision to adopt the iPhone at this time and why.

People with similar characteristics, tastes, and beliefs may associate in the same social networks (Manski 2000) and our sampling criteria were, therefore, that the group of individuals should be homogenous with similar characteristics and interests, and they should be part of the same social network. Homogenous sampling was chosen, as we wanted to understand the decision to adopt an iPhone in a particular group of early adopters. The participants were similar with respect to several variables, such as demographics and experience with mobile phones. As individuals who adopt at a very early stage can be expected to share characteristics, we recruited five closely related early adopters. One author had access to an individual who then contacted other individuals in his network who had also adopted the iPhone. Our investigation is, as a result, based on multiple perspectives. We observed and analyzed the behavior of the five individuals as a group while at the same time focusing on each individual, his social network, and decision-making.

Data Collection and Analysis

The study employed qualitative methods to understand the affluent nature of mobile users thought processes when overcoming uncertainties and adopting a new mobile device. The data collection took place from April 2008 to July 2008. It involved techniques such as semi-structured interviews, archival records, and data collected from a specific discussion forum on the Internet. The triangulation of data collection methods provides stronger support in the exploration of the research question (Eisenhardt 1989). The semi-structured interviews lasted from one hour to one hour twenty minutes. The interview-guide consisted of five main parts: demographics, the user’s mobile device history, the user’s iPhone history, the closed social network consisting of the five individuals, as well as each individual’s extended network, and finally the adoption decision.

Table 1 describes the five main themes the interview-guide was based on. Table 2 describes how the analysis phase was broken down into three phases (Eisenhardt, 1989).
### Table 1: The Interview Guide

<table>
<thead>
<tr>
<th>Theme</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Demographic data</td>
</tr>
<tr>
<td>Mobile device history</td>
<td>Experience with mobile devices; purpose of the device; experience with related products</td>
</tr>
<tr>
<td>iPhone history</td>
<td>Experience with the iPhone prior to adoption and after adoption; thoughts on future technological acquisitions</td>
</tr>
<tr>
<td>Social network</td>
<td>The network of the five individuals; the extended network of each individual</td>
</tr>
<tr>
<td>Adoption decision</td>
<td>Information gathering; thoughts prior to adoption of device; the actual decision; after receiving the device</td>
</tr>
</tbody>
</table>

### Table 2: Phases of Analyses

<table>
<thead>
<tr>
<th>Phase</th>
<th>Adoption level</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Individual level</td>
<td>Detailed description of each early adopter</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Individual and group level</td>
<td>Analyses of adoption decisions and behaviors based on four constructs from the social network literature</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Individual and group level</td>
<td>Identification and reflection on empirical results as contributions to the literature</td>
</tr>
</tbody>
</table>

### Table 3: Constructs Guiding the Investigation

<table>
<thead>
<tr>
<th>Construct</th>
<th>Description</th>
<th>References</th>
</tr>
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<tbody>
<tr>
<td>Adoption threshold</td>
<td>Does the proportion of individuals in the user’s close and extended network, who has adopted the iPhone, affect his decision to adopt? Does the individual have a low or a high network threshold, and are there any differences between the close network and the extended network?</td>
<td>Granovetter 1978</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Valente 1996</td>
</tr>
<tr>
<td>Opinion leaders</td>
<td>How did information about the iPhone enter the social network? Were there any opinion brokers to bring information about the iPhone into the network and someone who was the main driver of adoption within the group?</td>
<td>Burt 1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Valente &amp; Davis 1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Watts &amp; Dodds 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oh et al. 2006</td>
</tr>
<tr>
<td>Social contagion</td>
<td>How did other people’s attitudes toward, knowledge of, or behaviors toward the iPhone influence the decision? Did the individual decide to adopt the iPhone early?</td>
<td>Van den Bulte &amp; Lilien 2001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dodds &amp; Watts, 2004</td>
</tr>
<tr>
<td>Social learning</td>
<td>Did the individual observe his neighbors adoption decision prior to making an adoption decision? Did he interact with his social network to consult on their adoption decisions in order to be guided by informational or normative influences?</td>
<td>Tarde, 1899</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Katz &amp; Tushman, 1979</td>
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<td></td>
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<td>Katz, 1980</td>
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<tr>
<td></td>
<td></td>
<td>Ellison &amp; Fudenberg, 1993</td>
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<td></td>
<td></td>
<td>Burkhardt &amp; Brass, 1990</td>
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<tr>
<td></td>
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<td>Oh et al., 2006</td>
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</tbody>
</table>
The first phase focused entirely on the individual level and involved a detailed description of each of the five early adopters based on the main themes from the interview-guide (Table 1). The second phase focused on both the individual level as well as the group as a whole and it consisted of analyses that built on the descriptions from the first phase to explore how the four constructs in Table 3—social contagion, social learning, opinion leaders, and adoption threshold—could explain the decision to adopt the iPhone before it was commercially available in Denmark. The third phase focused on explicating contributions to the literature by systematically identifying and reflecting on the empirical insights in relation to the existing literature. The adoption process is analyzed at the individual level, taking group level influences into account. We refrain from generalizing to the organizational level as previous research (Venkatesh et al. 2003; Venkatesh and Davis 2000) has stated that adoption dynamics are different in mandatory and voluntary adoption and usage contexts.

RESULTS

Characterizing the Group of Adopters

There are several methods for categorizing adopters in general, the most well known are those by Rogers (2003) and Ryan and Gross (1943, 1950). however, these methods do not provide insights into how the iPhone is received before it has gone through its adoption curve. Constantiou et al.’s (2007) categorization of mobile adopters is developed for the purpose of dividing mobile users into distinct groups based on their usage behavior. Users can be categorized as talkers, writers, photographers, and surfers. Each new level is inclusive, so writers are also talkers, photographers are also talkers and writers, and surfers are also talkers, writers, and photographers. The authors argue furthermore, “Adoption of a new mobile service does not lead to abandonment of the previous ones but instead are adopted in addition to existing ones due to complementarities” (Constantiou et al. 2007, p. 52).

| Table 4: Description of Mobile Users Participating in the Study |
| --- | --- | --- | --- | --- | --- |
| Gender | Adam | Ben | Chris | David | Eric |
| Age | 36 | 33 | 33 | 34 | 33 |
| Occupation | Private sector | Private sector | Private sector | Public sector | Private sector |
| No. of mobile devices | ~ 7 | ~ 5 | ~ 14 | ~ 8 | ~ 20 |
| Previous mobile device | Sony Ericsson W950i | Sony Ericsson K800i | Nokia N73 | Sony Ericsson K810i | Nokia N95 |
| Service use | Talk, SMS, e-mail, calendar, Internet, MMS, camera, Mp3, games, 3rd party software (e.g., maps) | Talk, SMS, e-mail, calendar, Internet, MMS, camera, Mp3, games, 3rd party software (e.g., maps) | Talk, SMS, e-mail, calendar, Internet, Mp3, 3rd party software (e.g., maps) | Talk, SMS, e-mail, calendar, Internet, MMS, camera, Mp3, 3rd party software (e.g., maps) | Talk, SMS, e-mail, calendar, Internet, MMS, camera, Mp3, games, 3rd party software (e.g., maps) |
| Service experience | Surfer | Surfer | Surfer | Surfer | Surfer |
Table 4 provides a description of the observed five mobile users. They are all male in their early to mid-thirties, and they have extensive experience with mobile phones, which is apparent in years of experience with mobile devices, number of mobile devices, and service experience. The demographic data shows a homogenous group of individuals consisting of surfers. They are all situated in the capital of Denmark, Copenhagen, and are, hence, part of the urban population. According to Constantiou et al.’s 2007 study, the typical surfer is male, between twenty and forty years of age, has a higher education, and works in the private sector. Surfers seek information about new mobile phones regularly and are usually among the first to try out new mobile technologies and services. They like to experiment and find it fairly easy to make their mobile device perform as they wish.

The five adopters have more characteristics in common. They display a positive attitude toward change and science, which is apparent in their interest in obtaining the iPhone before its release in the US. They already used most functions on their previous mobile devices—all smart phones. The users appear to cope well with risk and uncertainty, as they bought the iPhone from the US and were forced to jailbreak and unlock the phone before being able to use it. They are highly interconnected in their social networks measured by number of Facebook “friends”—Table 5. This increases the flow of information. Furthermore, they benefit from vast exposure to media that delivers information about topics of interest—both mass media and interpersonal media channels, such as the discussion forum they participated in. They are active information seekers, and they display considerable knowledge of technological innovations.

| Table 5: Facebook Friends April 2008 and April 2009 |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | April 2008      | April 2009      |                 |                 |                 |
| Adam            | 890             | 1531            |                 |                 |                 |
| Ben             | 124             | 143             |                 |                 |                 |
| Chris           | 635             | 1089            |                 |                 |                 |
| David           | 194             | 373             |                 |                 |                 |
| Eric            | 672             | 2000            |                 |                 |                 |

The five adopters are furthermore highly interconnected as suggested by the number of Facebook friends the five adopters have in common—Table 6. This pattern of common friends relates to Dunbar (1995) who initially used cross-cultural studies to predict that humans socialize in groups of approximately 150 individuals—also referred to as the Dunbar number. Later Hill and Dunbar (2002) raised the question whether social networks in modern, postindustrial societies exhibit a comparable pattern, and they found that social networks are still constrained to 150 due to limits in human communication.

| Table 6: Number of Friends in Common, Facebook April 2008 |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | Adam            | Ben             | Chris           | David           | Eric            |
| Adam            | 890             | 115             | 254             | 115             | 165             |
| Ben             | 115             | 124             | 96              | 27              | 105             |
| Chris           | 254             | 96              | 635             | 96              | 155             |
| David           | 115             | 27              | 96              | 194             | 194             |
| Eric            | 165             | 105             | 155             | 105             | 672             |

Evidence for Individual Adoption Decisions

The five adopters decided to adopt the iPhone at different points in time ranging from September 2007 to March 2008. In the following, we present each individual adopter and his reflections leading to the decision to adopt.

Adam, thirty-six years of age, holds a leading position in a private company within the music industry. He obtained his first mobile device in 1994 and acquires a new device approximately every second year the iPhone in December 2007—five months after its release in the US. He waited five months to buy the iPhone even though he always knew he had to attain it, as he was concerned with the lack of 3G. Adam had possessed iPods for years; however, he does not particularly use Apple products. He monitored the exposure of the iPhone in the media and noticed an explosion in the development of techniques on how to jailbreak the firmware on the iPhone. He is, furthermore, a member of the discussion group, HF, on the Internet where he and others discussed the recent development in releasing the iPhone and how to jailbreak and unlock the device. He decided to buy the iPhone when a friend let him try out the device.

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3 According to statistics on Facebook, the average user has 120 friends.
Ben is thirty-three years. He holds an analyst position in a private company and creates music in his leisure time. He obtained his first mobile device in 2000 and acquires a new device roughly every second year. He obtained his iPhone in March 2008 when he travelled to the US, and he acquired several copies and brought them to Denmark to his friends. Ben has possessed iPods for four years and Mac computers for five years, mostly for music production purposes. He is an Apple enthusiast and was initially invited to the iPhone through the media. He watched the MacWorld Expo presentation of the iPhone on the Internet. He also discussed the device with friends and acquaintances and was at an early point convinced he would obtain the iPhone. Ben decided to adopt based on two considerations. First, the instructions on the Internet on how to jailbreak and unlock the phone had advanced and it was now rather easy to do. Second, he was traveling to the US and could easily buy one. He says, “When I held it the first time, I just knew I had to get it now. I didn’t want to wait any longer.”

Chris is thirty-three years and works as a consultant in a private company. He obtained his first mobile device in 1994 and acquires a new device approximately every year. He bought his iPhone March 2008. Chris went to the US in December 2007 and seriously thought of acquiring the device at that time, but decided to wait. His mobile device at the time suddenly got slower, and he decided to obtain the iPhone when returning to the US in March 2008. Chris has been in possession of PowerBooks and iPods since 1999 and can be labeled an Apple-consumer. He followed the presentation and release of the iPhone through the media and participated in the discussion forum HF. He had made a decision to acquire the phone even before the release. When it was released in the US, he did not have an excessive need and thought that the device would come to Denmark quickly in a 3G version. However, as the Danish release was extended and his mobile device at the time became slow, he decided he couldn’t wait any longer when he travelled to the US. He added: “I will definitely buy the phone when it comes to Denmark in a 3G version.”

David is thirty-four years and holds a project management position in a public institution. He obtained his first mobile device in 2000, acquires a new device approximately every year, and bought his iPhone in January 2008. David has been using his households’ Mac hardware and software, although he states that the only Apple product he has owned himself is the iPod (2001). David has been aware of the iPhone since before Apple’s presentation and he always knew he would acquire one. When asked why, he stated, “It’s partly a question of practicality, gathering all gadgets into one, so that you don’t have to carry all these devices in your pockets. And it’s partly a question of being able to use the services that the network operators have tried to push for so long. We now have a device that shows applications as if you were sitting in front of your computer. Now mobility is for real.” He was concerned that the device was not made for the Danish market; however, he finally decided to obtain the iPhone, not waiting for the Danish release: “The iPhone was too cool, and I don’t want to wait for some decelerated network operator to get their stuff together … it is an unheard of situation, that it’s not just there, and agreements have to be made.”

Eric, thirty-three years of age, holds a project coordinator position in a private company and performs music in his leisure time. He obtained his first mobile device in 1994 and acquires a new device approximately twice a year. He acquired his iPhone in September of 2007. Eric has extensive knowledge about Apple’s computers, as he has been using both iMac and MacBook for several years. However, he had, never had an iPod before he acquired the iPhone. Eric has been aware of the iPhone since before it was presented at the MacWorld Expo conference: “That was the first time pictures were revealed. Here it is. But even before that, in 2006, there were a lot of speculation on what the phone would look like. I remember a lot of photos of white phones that matches the look of the white MacBooks.” He noticed that, whenever Apple releases a new product, they create plethora of hype, and they succeeded in building up excitement about the iPhone. It became prestigious to possess an iPhone.

Analyzing Social Network Influences

Adoptions thresholds of collective behavior are the proportion of adopters in a social system needed for an individual to adopt an innovation (Granovetter 1978). We asked the iPhone adopters how many people in their network they knew had adopted the iPhone prior to their acquisition. Adam replied five and the rest replied one. Given that they had between 124 and 890 Facebook friends at the time (see Table 5), the proportion of iPhone adopters in their networks was relatively small; between 0.0015 (Chris and Eric) and 0.08 (Ben). At the time of the interviews the five adopters believed that between 10 and 60 people in their extended network had adopted the iPhone. This indicates that all five adopters have a low network threshold in regard to their extended network. Eric was the first to adopt the iPhone (September 2007) and is also the person with the lowest network threshold in regard to his close network. Adam was also aware of a benefit of adopting early: “It is still a bit nerdy. You can’t go down in the local store and buy one yet.” Hence, the five early iPhone adopters all have a low network threshold, both in regard to their close network and their extended network.

The interviews were conducted in April 2008; eight months after the first adopters in the study acquired their iPhone, one month after the latest adopters in the study adopted the iPhone and three months before the iPhone was released on the Danish market.
Opinion leaders are “opinion brokers who carry information across the social boundaries between groups” (Burt 1999, p. 37) to stimulate contagion by cohesion or contagion by structural equivalence. We asked the five adopters how many contacts they had in common (Table 6) and how many contacts they had in their extended network (Table 5). The number of Facebook friends is the most precise measure of the adopters’ networks we could obtain. Adam, who had the highest number of Facebook friends at the time (see Table 5) of the interview, reflected that the high number is a consequence of him working in the music industry, and he does not have frequent interaction with most of his contacts. Chris’s and Eric’s high numbers of Facebook friends are also the result of socializing with individuals through the music scene. The five adopters have between twenty-seven (Ben and David) and 254 (Adam and Chris) friends in common (see Table 6). According to all of them, there was no single person who brought information about the iPhone into their extended networks. Though they all had decided to obtain the iPhone at some point, it was the testing of a friend’s device that stimulated the acquisition. All adopters claim they actively sought information about the iPhone as soon as they became aware of it. There is hence no evidence that opinion leaders played a significant role in the adoption decision made by the five adopters.

Social contagion refers to an individual’s decision to adopt an innovation depending on other individuals’ attitudes, knowledge, or behaviors concerning the innovation (Van den Bulte and Lilien 2001). Mobile adopters with higher number of direct ties have greater opportunities to disseminate and receive information about the iPhone because they have more choices (Granovetter 1973; Burt 1999). Thus the number of direct ties captures the power and the opportunities to receive information about the iPhone. According to statistics on Facebook, the average user has 120 friends, which is also supported by a small-scale investigation conducted by the Economist (Kluth 2009). All five iPhone adopters in this study have a number of friends higher than the average, which increases the likelihood of getting contaminated with attitudes, knowledge, and behaviors toward the iPhone from their Facebook network.

As identified by Van den Bulte and Lilien (2001) four mechanisms may cause social contagion (see Table 3).

Information transfer occurs both from traditional media, such as newspapers and TV, and Internet-based media, such as podcasts, to individual mobile users, as well as between individuals. The five adopters all received information and news about the iPhone from various types of media, and all except Ben were part of a particular discussion forum on the Internet. The main topic of the forum was electronic music, but the participants also discussed related topics, including the latest news on the release of the iPhone. As the five adopters are part of the same social setting and met regularly, they also exchanged information directly. Adam even decided to buy the iPhone at the exact moment a friend in his extended network let him try out his iPhone. He says, “It is my clear belief that this is where something snaps. One thing is what you read … everybody’s skeptic … but that is only until you get a demonstration.” Hence, information transfer and demonstrations from both different media and the social network had significant influence on each individual’s decision to adopt the iPhone.

Normative pressure occurs when the mobile user experiences discomfort, when peers whose approval they value have adopted an innovation, but they have not yet adopted it themselves. When asked how many people in their social network owned an iPhone before they bought theirs, Adam answered five, and the four other adopters answered one. There is, therefore, no evidence that normative pressures influenced the iPhone adopters.

Competitive concerns can be viewed as opposed to normative pressures. As Eric stated, “The iPhone has a high prestige factor that will probably descend when it is released in Denmark.” He further argued that the iPhone attracts a lot of attention from peers who do not own an iPhone. Adam and Ben have a similar view. David, on the other hand, does not feel that competition had any influence on his adoption decision. He believes that the iPhone is simply the best phone on the market, which Chris agrees with. Hence, it appears that competitive concerns influenced some individual’s decision to adopt the iPhone.

Performance network effects refer to the benefits of use that increase with the number of prior adopters of the innovation. These effects are apparent for mobile devices in general as the benefits of usage increases with the amount of prior users. As all five adopters had advanced mobile devices prior to the iPhone and most of these devices offer similar communication functions (talk, text messaging, instant messaging), the adopters did not experience increased network effects from adopting an iPhone, as compared to their previous phone, or after their friends adopted it.

Social learning is related to social contagion. As mobile users are faced with uncertainty in the decision to adopt the iPhone, they may observe their neighbor’s choices and interact with their social network to consult on their adoption decision through informational and normative social influences (Burkhardt and Brass 1990; Katz and Tushman 1979; Katz 1980). We asked the five adopters if they would be able to make the iPhone work when they received it and if they depended on other people in their network to help them. All five adopters replied they had at least one friend they relied on to help in case they were not able to make the iPhone work by themselves. However,
they all initially depended on themselves to be able to jailbreak and unlock the phone based on instructions from a website. David made the purchasing decision when “the instructions became easy to comprehend, and I could see myself fix everything—installation of new applications, jailbreaking, unlocking, update firmware. Everything that had to do with the iPhone, I could do it myself without being dependent on others.” Adam found: “It became a competition for Mac nerds to determine who could break the latest firmware. So, the information and software on the web is quite good. Therefore, there is evidence that social learning played an important part in the individual’s decision to adopt the iPhone.

DISCUSSION

We have presented a case study investigating the behaviors and decisions of a group of five early adopters of the iPhone. Drawing on utilitarian research on mobile adoption studies (Pedersen and Ling 2002; Carlsson et al. 2000) as well as studies that have established correlation between an individual’s social network and the decision to adopt (Dickinger et al. 2008; Lu et al. 2005), our study provides a detailed description of adopters that faced high uncertainties when adopting the iPhone before it was readily available. We offer new insights into how early adopters of mobile devices overcome uncertainties related to shifts in technology. Explaining these behaviors can be challenging, and relying on too simplistic models might not suffice. Therefore, we relied on multiple perspectives and were open to question insights from traditional adoption theory. Such an explorative, multi-construct, and multi-perspective has previously been left unexamined.

We analyzed both individual adoption decisions as well as social network influences. In contrast to existing studies on early adoption (Wozniak 1987; Kauffman and Techatassanasoontorn 2009), our study was based on a qualitative approach in which we used four complementary social network influence constructs—adoption threshold, opinion leaders, social contagion, and social learning. Interestingly, these analyses confirmed some previously identified insights and questioned others.

The study confirms that contemporary mobile devices revolutionize many aspects of everyday life (Green et al. 2001) as they combine many gadgets into one device. The study also shows that when facing uncertainty, adoption decisions emerged as a combined result of individual adoption reflections and major influences from the social network, as well as behaviors observed within the network. Specifically, the analyses confirmed that network structures impact the decision to accept a mobile device (Vigden et al. 2007; Katz 1961; Rogers 2003) while also revealing new details on social network influences on early adoption decisions.

The study also supports several insights from previous work on mobile adoption. Lu et al. (2005) found that perceived ease of use of wireless Internet services on mobile devices had a direct effect on the intention to adopt the service. Our study supports this finding, as the early adopters of the iPhone relied on easy to use instructions on how to jailbreak and unlock their iPhone as well as on their network to provide the help they needed. Similarly, Dickinger et al. (2008) found that attitudes toward “Push to Talk” services had a positive effect on the intention to use the service. Our study shows that early adopters of the iPhone had a positive attitude toward the device long before it was released, contributing to their intention to adopt.

Finally, the study is consistent with previous research on characterization of adopters. Lu et al. (2005) found that personal innovativeness had an impact on intention to adopt wireless Internet services via mobile technology. Constantiou et al. (2007) divided mobile users into categories that describe several traits of each category: talkers, writers, photographers and surfers. The personal innovativeness construct and Constantiou et al.’s (2007) description of the “surfer” fits well with our early adopters who all belong to the surfer category. Wozniak (1987) studied early adoption of new technology in organizations and found that adoption behavior is a “human capital intensive activity” that depends on acquired human capital and investment into receiving adoption information. Our study confirms that the social influence construct “information transfer” which is part of social contagion was characteristic for the observed early adopters.

As a new contribution to our understanding of how early adopters of mobile devices overcome uncertainties related to shifts in technology, the combination of four constructs from social network research provided the comprehensive insights summarized in Table 7. Low adoption threshold (Granovetter 1978; Valente 1996) was characteristic of the early iPhone adopters. The threshold construct considers only the proportion of adopters without taking into account whether one particular individual had greater influence on an individual’s adoption decision. The opinion leader construct, however, addressed this issue. Opinion leaders carry information about the iPhone across social boundaries between groups of people (Burt 1999; Valente and Davis 1999; Watts and Dodds 2007; Oh et al. 2006). However, the study showed no evidence that the adoption decision was influenced by opinion leaders.
Table 7: Results

<table>
<thead>
<tr>
<th>Social network construct</th>
<th>Result</th>
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<tbody>
<tr>
<td>Adoption Threshold</td>
<td>Adopters had low adoption threshold.</td>
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<tr>
<td>Opinion leaders</td>
<td>No evidence that opinion leaders had an impact</td>
</tr>
<tr>
<td>Social contagion</td>
<td>Information transfer had an impact.</td>
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<td></td>
<td>Competitive concerns</td>
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<td>Normative pressure</td>
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<td>Performance network effects</td>
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<td>Social learning</td>
<td>Social learning had an impact.</td>
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Considering social contagion (Van den Bulte and Lilien 2001) mechanisms, the analysis showed vast support for the impact of the information transfer that occurred from various media, as well as between the five individuals and their extended networks. Hence, Katz and Lazarsfeld’s (1955) “two-step flow” concept may explain why opinion leaders did not have direct impact on the observed adoption decision-making. Competitive concerns (Burt 1986) had some influence on the observed adoption decision-making. The adopters agreed that the iPhone attracted a lot of attention from peers; however, three adopters viewed this as a beneficial trait of possessing the iPhone, whereas two adopters felt they had no competitive concerns. Finally, our analysis revealed no evidence for normative pressure and positive network effects.

Social learning (Tarde 1899; Katz and Tushman 1979; Katz 1980; Ellison and Fudenberg 1993; Burkhardt and Brass 1990; Oh et al. 2006) overlaps partly with the contagion construct and focused on how the five adopters observed the choices of other individuals in their network and consulted with them on their iPhone adoption decision. As a conscious process of interactions between related individuals—in contrast to contagion resulting from brief encounters to share information about the iPhone—social learning played an important part in the individual’s decision to adopt the iPhone.

This comprehensive analysis of how five early adopters of mobile devices overcame uncertainties related to shifts in technology reveal interesting behaviors that differ from expectations. First, opinion leaders were found to have no influence on adoption of the iPhone; i.e., the individuals acquired information about the iPhone themselves and were not influenced by a particular person in the social network. The social network influence occurred at later stages in the process. Watts and Dodds (2007) argue that social change is typically driven by easily influenced individuals influencing each other. However, we found no evidence among the observed early adopters that they were easily influenced. They all had extensive experience with mobile devices and were among the first to try out—and in some cases discard—new technologies. Opinion leaders’ influence is direct and derives from their informal status as being informed, respected, or simply “connected” (Watts and Dodds 2007). The five observed early adopters may therefore have acted on their own rather than have been subjected to opinion leaders. A second interesting behavior among the five early adopters is their limited emphasis on competitive concerns. While the analyses showed some evidence of this aspect—the social contagion construct—we would expect these early adopters to be more strongly competitive, as they belong to the surfer category (Constantiou et al. 2007). An explanation for this may be that the iPhone simply was a breakthrough mobile device and the best on the market at the time.

Our findings have implications for the development of new mobile devices and platforms. The initial exclusive collaboration between the producer of the iPhone (Apple) and the network provider (AT&T in the US) was an attempt to control market forces by providing a business proposition of revenue sharing from applications developers and network operators. However, as this study shows, some individuals overrule company strategies to break normal practice. In this case, software was developed and made available for free on the web along with recipes for jailbreaking and unlocking iPhones in order to make them work on other network providers’ networks. Adopters of the iPhone did not only develop software to access the iPhone on other networks, they also created third-party applications and made them available for download and use. As a response, in March 2008, Apple released a software developer kit (SDK) that allows developers to create applications for the iPhone and test them on an iPhone simulator. It is, however, only possible to load applications onto the devices after paying an iPhone Developer Program fee; applications are, furthermore, to be downloaded via the Apple App Store in iTunes—Apple’s music download software. As a consequence, the production of third-party applications has exploded. On July 10, 2008, Apple CEO Steve Jobs announced that the App Store contained 500 third-party applications for the iPhone.
Eight months later, the App store had passed 30,000 applications\(^5\) and by February 2010 the store contained 150,000 applications\(^6\). Two points may be derived from our research and these subsequent events. First, when producing and hyping a groundbreaking technology, the very first global adopters will do what it takes to be able to use the new technology, and they will share solutions with their network to help peers overcome potential uncertainties and enjoy similar benefits. Second, the subsequent user involvement approach worked for Apple (although Apple continues to be a closed innovation company) and may also be incorporated in the strategy of other mobile device and platform developments.

**CONCLUSION**

This paper outlines a social network perspective on adoption of the iPhone at a very early stage. We used the case study method to explore why and how five closely related individuals made the decision to adopt the iPhone before it was made available through conventional supply chains. The findings suggest this perspective is useful for research that seeks to leverage social network constructs to understand adoption situations. Our research specifically demonstrates how the combination of four different constructs—adoption threshold, opinion leaders, social contagion and social learning—provided detailed insights into behaviors and interactions that allowed us to explain how and why the social network impacted the five individuals’ decision to adopt the iPhone.

Still, it is important to consider alternative explanations. The artifact itself possesses some unique characteristics that were emphasized by the adopters; design characteristics as well as utilitarian characteristics. Following the observation of Orlikowski and Iacono (2001) that the IT artifact tends to be taken for granted in research, we acknowledge that the iPhone itself had significant impact on the adopters’ decision-making beyond the focus of our analyses. It is also of interest to look at Apple’s marketing effort. Van den Bulte and Lilien (2001) found that when they control for marketing efforts in the diffusion of the drug Tetracycline, contagion effects disappear. The heavy promotion of the iPhone by Apple, the hype that was created by the media and the public, and the limited supply of iPhones (Verhallen 1982, Verhallen and Robben 1994; Lynn 1991) could have had additional important influences on the five adopters. This observation relates to Leibenstein’s (1950) “snob effect,” and, though the five adopters did not see themselves as “snobs,” they agreed that owning the iPhone at the time was prestigious.

Our research involved some limitations. The sample used in the study is rather homogenous. Though we believe that early adopters at this stage exhibit certain common traits, we acknowledge that it could have been interesting to compare the results with other types of users with other characteristics. The nature of the research question, which required a sample containing a group of closely related adopters and access to very early adopters, was very limited. We believe that our trade-offs were necessary to conduct a study as rich in information on mutual relationships as this study is. Acknowledging the limited opportunities to generalize based on our sample, we found a qualitative, in-depth approach the most appropriate method of investigation. However, the insights provided from our research are encouraging and demonstrate that more research on the very first adopters of groundbreaking technologies is needed.

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